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WATER SECURITY: A SUMMARY OF KEY FINDINGS EXPLORING ISLANDS IN BRAZIL[1]

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Abstract. This paper presents key findings from an 'immersion' that was undertaken in August 2017 on Paquetá and surrounding islands within the Amazon region of Brazil. In this research, immersion is understood as active participation in peoples' lives over a period of time and supported by other methods including observation, semi-structured interviews and co-mapping. This research adapted the urban metabolism concept commonly used to assess levels of sustainability and resilience, for application to the context of peripheral river islands located in the Tocantins river near the Brazilian city of Belém. It specifically focuses on factors that impact on people's behaviour in relation to water management, or what is described here as the 'island water metabolism'. This includes geographic, seasonal, local governance and social dimensions as well as dependence on the rising and falling tides of the river.

Keywords: Water security; Water metabolism; Water management; Island metabolism; Immersion; Seasonality

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JEL Classifications: I00, Z00, Z10

1. Introduction

The Brazilian government aims to ensure equitable access to safely managed drinking water for all by 2030 as part of its commitment to the United Nations Sustainable Development Goals (WASHWatch, 2017). While some progress has been made, a proportion of the population in both rural and urban areas continue to live without sufficient access (Grojec, 2017; Rocha et al. 2018; Cardoso et al. 2018; Muniz et al. 2018; Rivza, Kruzmetra 2017). The research examines the particular challenges of access to clean water on Paquetá and surrounding islands which are located in the Tocantins river on the periphery of Belém, the capital city of the Brazilian state Pará. The research makes use of the 'urban metabolism' concept which can be described as socio-technical, socio-economic and socio-ecological flows including water resources, people and information in, out and within the city (Currie & Musango, 2016; Kennedy, Cuddihy and Engel-Yan, 2007). Circular or zero-waste metabolisms are seen as sustainable and resilient (Agudelo-Vera, 2012) whereas linear metabolisms are understood as unsustainable and vulnerable (Klindworth *et al.*, 2017; European Development Agency, 2015, p.26). In this paper, the aforementioned conceptual framework has been adapted to the 'water metabolism' of peripheral river islands and 'island metabolisms' more broadly.

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2. Methodology

The author conducted a five-day immersion on Paquetá island in August 2017 in order to gain human insights into key factors that determine people's behaviour in relation to the island water metabolism. This included visits to households on the neighbouring islands of Jutuba and Arapiranga. Immersion was enabled through an already established link between researchers at the Federal University of Pará and supported by a range of methods including observation, semi-structured interviews conducted with the help of a translator and co-mapping of infrastructure distribution. This study formed part of the wider AguaSocial project which has been described in other publications (Iorio *et al*., 2018).

A key limitation arises from the fact the immersion was relatively short but more importantly that it only covered one visit, thereby leading to potential 'seasonal blindness', a biased understanding of local life based on the limited insights gained from one season (Chambers, 2012, p.38). The author's positionality as a female 'outsider' unable to freely converse in Portuguese should also be acknowledged (Merriam, 2001, pp.405-416).

3. Summary of key finding and discussion

3.1 Island life and the rising and falling tides of the Tocantins river

Paquetá is part of a small group of islands located where the waters of the Gujajará Bay meet the Tocantins river before they empty into the Atlantic Ocean approximately 100km to the North East. The distance between the mainland (Belém) and Paquetá is circa five kilometres. Behind the island the river stretches another 25 kilometres before it reaches the bank on the other side, which is technically the shore of a large river island (i.e. approximately the size of Switzerland).

The close proximity to the sea means the vast river which surrounds Paquetá and neighbouring islands is tidal. As such, individual and small clusters of households which are predominately located along the island shores and interior waterways are built on stilts. Raised walkways lead up from the river and connect clusters of buildings, or lead to separate toilet blocks that are located away from the main structures (Figure 1).

Figure 1. A raised walkway leading up to a house on stilts
(*Note*: when the tidy is high, the water reaches far beneath the building)

Source: Personal photo

The intra-island, inter-island and island-city networks which are the basis for economic and social activities are all dependent on access by boat. For example, this may include: going to school on Jutuba or Cotijuba; attending church on Arapiranga; accessing health care; or visiting friends and family on different parts of the island network. Similarly, transporting goods such as fuel or bottled water, fishing or collecting and selling açaí berries (a lucrative palm fruit supplied to Belém) require the use of a boat. In turn, these activities and the social and resource networks that sustain them form the island metabolism and are all dependent upon the rising and falling tides of the river that connects them.

3.2 Distribution of water infrastructure

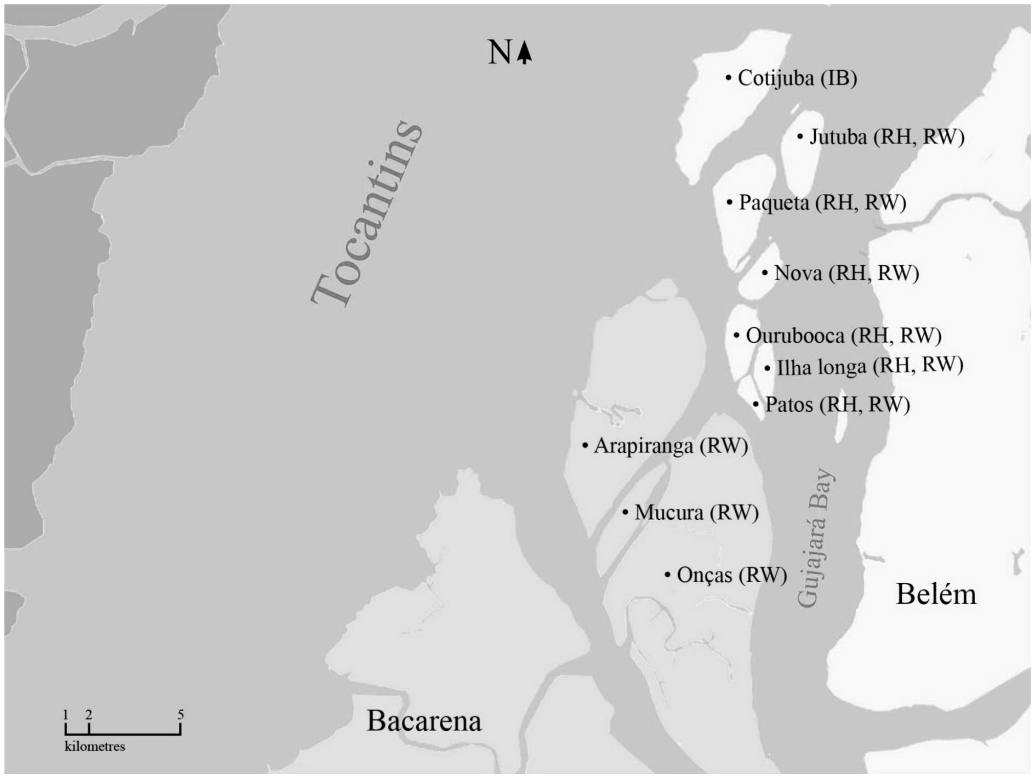
Unlike the activities and public services listed above, the provision of drinking water has the potential to be independent from the tidal cycle of the river. The island of Cotijuba, which is more developed, has a borehole that supplies the island with drinking water, as well as grid electricity and road infrastructure. However, on Paquetá and other islands access to clean water remains a challenge. In these areas, the dispersed location of households means that off-grid solutions are likely to be the most appropriate solution for the provision of drinking water. This is already reflected by the widespread use of water infrastructure that collects river and/or rainwater at the household level. Those living on the islands of Arapiranga, Mucura and Onças depend on river water for decentralised supply at household level which is pumped into raised tanks and distributed using gravitational force. Discussions with the local community indicated that common health issues on Arapiranga include vomiting and diarrhea. It is likely that these problems are linked to the poor quality of their drinking water, though people across the islands also regularly come into contact with river water when they bathe in it.

Figure 2. Rainwater harvesting installation on Jutuba

Source: Personal photo

Like Arapiranga, Mucura and Onças, households on Paquetá, Atos, Longa, Curubooca, Nova and Jutuba also have access to river water. However, in addition they have benefited from government subsidised rain water harvesting systems (Figure 2). Locally, rain is perceived to provide better water quality. Whether or not an island is served by rainwater harvesting infrastructure depends upon which municipal area they belong. Paquetá, Atos, Longa, Curubooca, Nova and Jutuba (as well as Cotijuba) belong to the municipality of Belém, whereas the other islands mentioned fall under the governance of Bacarena (Figure 3). The respective influences of local authorities and other key stakeholders over the implementation of water infrastructure in this region has been explored within a recent study (Cardoso Castro *et al.*, 2017).

Figure 3. Water infrastructure across islands and municipal borders
(RH: rainwater harvesting; RW: river water; IB: island borehole.



Source: IBGE (2017)

It is evident that these administrative borders do not reflect the inter-island social networks that underpin island life. At first glance this may not appear particularly relevant, however these informal networks already support inter-island maintenance for other technologies and infrastructure development including repairs of boat engines and timber constructions.

3.3 Seasonal factors

During the time of the immersion exercise, local people across households on several islands described that there was insufficient rainfall to benefit from their rainwater harvesting installations. Instead they bought in bottles of water (Figure 4), temporarily rendering what could be a potentially circular system to provide clean drinking water into a linear system which depends on resources shipped in from the mainland. However, this coincided with the beginning of the açaí season which runs from August to January. Collecting açaí constitutes a major economic activity for people on Paquetá and neighbouring islands. Reportedly, açaí provides a good and reliable income unlike fishing which is the focus for the rest of the year. Therefore, the financial burden of buying in water, including fuel cost for transport, is lessened by lucrative economic activity when the açaí season and dry season overlap. The geographic location, particularly of households deep inside the interior waterways of islands such as Araprianga, may also influence who is able to access bottled water as an alternative to river water. Here, the rising and falling tides as well as cost of diesel powered transport to cover longer-distances may be felt more severely than on the shores of Paquetá.

Figure 4. Bottled water supplements drinking water during periods of low rainfall.

Source: Personal photo

4. Conclusions and scope for further research

The research has highlighted that the island water metabolism is influenced by seasonal, geographic and local governance factors which impact on access to water resources. Undertaking immersions during different times of the year would lead to a more holistic understanding of water access including seasonal factors. While the supply of decentralised water has the potential to support a circular water metabolism on Paquetá and surrounding islands, the social networks that support island life in general should be also considered particularly in relation to maintenance and finance. Here, in-depth research into how islanders organise could lead to locally appropriate business models to support the long-term sustainability of infrastructure development beyond the borders of municipal areas. As such, the resilience of the water metabolism of one island should not be seen in isolation from the others.

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